18492

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Remote Controlled Transmission & Echoing TELNET Option 1

Currently, a terminal in character-at-a-time transmission and foreign-host echo causes four Network Messages for each character struck. (The character sent from local to foreign host; its RFNM; the echoed character sent from the foreign to the local host; and its RFNM.) 1a

By eliminating most echoing (1/2 as many messages) and packaging the characters into useful units (assuming an average of five character per unit; therefore another 80 per cent reduction), it is believed that almost a 90 per cent reduction in character-mode interactive Network terminal traffic can be attained. 1b

The packaging of characters and elimination of foreign echoing should also lessen the load placed on the foreign hosts. 1c

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Remote Controlled Transmssion and Echoing Telnet Option

2

1. Command name and code: 2a

RCTE 2a1

2. Command meanings: 2b

IAC WILL RCTE 2b1

The sender of this command REQUESTS or AGREES to use the RCTE option, and will send instructions for controlling the other side's terminal printer. 2b1a

IAC WON'T RCTE 2b2

The sender of this option REFUSES to send instructions for controlling the other side's terminal printer. 2b2a

IAC DO RCTE 2b3

The sender REQUEST or AGREES to have the other side (sender of WILL RCTE) issue commands which will control his (sender of the DO) output to the terminal printer. 2b3a

IAC DON'T RCTE 2b4

The sender of this command REFUSES to allow the other side to control his (sender of DON'T) terminal printer. 2b4a

IAC SB RCTE <cmd> [BC1 BC2] [TC1 TC2] 2b5

where: 2b5a

<cmd> is one 8-bit byte having the following flags (bits are counted from the right): 2b5a1

Bit Meaning 2b5a1a

0 0 = Ignore all other bits in this byte and repeat the last <cmd> that was sent. Equals a 'continue what you have been doing'.
1 = Perform actions as indicated by other bits in this byte. 2b5a1b

1 0 = Print (echo) Break character
1 = Skip (don't echo) Break character 2b5a1c

2 0 = Print (echo) text up to Break character
1 = Skip (don't echo) text up to Break character 2b5a1d

3 0 = Continue using same classes of Break characters.
1 = The two 8-bit bytes following this byte contain flags for the new Break classes. 2b5a1e

4 0 = Continue using same classes of Transmit characters.
1 = Reset Transmit classes according to the two bytes following 1) the Break classes bytes, if the Break classes are also being reset, or 2) this byte, if the Break classes are NOT also being reset. 2b5a1f

Value (decimal) of the <cmd> byte and its meaning: 2b5a1g

0 = Continue what you have been doing 2b5a1g1

1 = Print (echo) up to AND INCLUDING Break character 2b5a1g2

3 = Print up to Break character and SKIP (don't echo) Break character 2b5a1g3

5 = Skip text (don't echo) up to Break character, but PRINT Break character 2b5a1g4

7 = Skip up to and including Break character 2b5a1g5

Add one of the previous non-zero values to one of the following values, to get the total decimal value for the byte (Note that Classes may not be reset without also resetting the printing action; so an odd number is guaranteed): 2b5a1g6

8 = Set Break classes (using the next two bytes [BC1 BC2]) 2b5a1g7

16 = Set Transmission classes (using the next two bytes [TC1 TC2]) 2b5a1g8

24 = Set Break classes (using the next two bytes (BC1 BC2)) and the Transmission classes (using the two bytes after that (TC1 TC2)). 2b5a1g9

Sub-commands (IAC SB RCTE...) are only sent by the Controlling Host and, in addition to other functions, functionally replace the Go-Ahead (IAC GA) Telnet Command. 2b5b

3. Default: 2c

WON'T RCTE -- DON'T RCTE 2c1

Neither host asserts special control over the other host's terminal printer. 2c1a

4. Motivation for the option: 2d

RFC's 1, 5 and 51 discuss Network and process efficiency and smoothness. 2d1

RFC 357, by John Davidson, introduces the problem of echoing delay that occurs when a remote user accesses a full-duplex host, thru a satellite link. In order to save the many thousands of miles of transit time for each echoed character, while still permitting full server responsiveness and clean terminal output, an echo control similar to that used by some Time-sharing systems is suggested for the entire Network. 2d2

In effect, the proposed option involves making a user host carefully regulate the local terminal printer according to explicit instructions from the foreign (serving) host. 2d2a

An important additional issue is efficient Network transmission. Implementation of the Davidson Echoing Scheme will eliminate almost all server-to-user echoing. 2d3

The proposed option also requests using hosts to buffer a terminal's input to the foreign host until it forms a useful unit (with "useful unit" delimited by Break or Transmission characters as described below). Therefore, fewer messages are sent on the user-to-server path. 2d3a

N.B.: This option is only intended for use with full-duplex hosts. The Go-Ahead Telnet feature is completely adequate fo HALF-duplex server hosts. 2d4

5. Explicit description of control mechanism: 2e

A. Overview of Interaction 2e1

(1) Agree to use RCTE option 2e1a
(2) User holds echo printing until instructed by server to do otherwise 2e1b
(3) Server may send output to terminal printer. 2e1c
(4) Network output is printed up to an RCTE command 2e1d
(5) Server sends IAC SB RCTE <cmd> 2e1e
(6) User acts upon the command up to a Break character or until receipt of output from the server host. 2e1f
(7) Go to (2) 2e1g

Note: Output from the server host may occur at any time, in which case, the flow of control switches to (2) and then proceeds to (3), (4), etc. 2e1h

B. Explanation: 2e2

(1) Both Hosts agree to use the RCTE option. After that, the using host (IAC DO RCTE) merely acts upon the Controlling (serving) host's commands and does not issue any RCTE commands unless and until it (using host) decides to stop allowing use of the option (by sending IAC DON'T RCTE). 2e2a

(2) User host begins synchronization between the serving host and itself by suspending terminal echo printing until directed to do otherwise by the controlling host, thru an IAC SB RCTE <cmd>. 2e2b

(3) The server may send output to the terminal printer, either in response to input from the user (in which case it is already syncnronized with the terminal input) or spontaneously. In the latter case, flow of control automatically switches to (2) and continues from there. Output from the server is defined as completed when step (5) occurs. That is, text from the Server to the terminal printer MUST end with an RCTE command. 2e2c

(4) Any output from the server is printed on the terminal IMMEDIATELY. Again note that the end of such output is defined to be the occurrence of an IAC SB RCTE <cmd> command. 2e2d

(5) Server sends an RCTE command. The command may redefine Break and Transmission classes, Action to be performed on Break characters, and action to be performed on text. Each of these independent functions is controlled by separate bits in the <cmd> byte. 2e2e

a. A Transmission character is one which REQUIRES the User Host to transmit all text accumulated up to and including its occurrence. (For Net efficiency, User hosts are DISCOURAGED from sending before the occurrence of a Transmission character). 2e2e1

If the Transmission Classes bit (Bit 4) is on, the two bytes following the two Break Classes bytes (or immediately following the <cmd> byte, if the Break Classes bit is not on) will indicate what classes are to be enabled. 2e2e1a

If the Bit is OFF, the Transmission classes remain unchanged. When the RCTE option is first initiated, NO CLASSES are in effect. That is, no character will be considered a Transmission character. (As if both TC1 and TC2 are zero.) 2e2e1b

b. A Break character has the effect of a Transmission character, but also causes the User host to stop its print/discard action upon the User's input text, until directed to do otherwise by another IAC SB RCTE <cmd> command from the Serving host. Break characters therefore define printing units. "Break character" as used in this document does NOT mean Telnet Break character. 2e2e2

If the Break Classes bit (Bit 3) is on, the two bytes following <cmd> will indicate what classes are to be enabled. There are currently nine (9) classes defined, with room for expansion. 2e2e2a

If the bit is OFF, the Break classes remain unchanged. When the RCTE option is initiated, CLASSES 4, 5, and 9 are to be in effect. That is, Format Effectors, Non-format effector Control Characters and DEL, and Punctuation characters are to be Break characters. 2e2e2b

c. The list of character classes, used to define Break and Transmission classes are listed at the end of this document, in the "Tables" Section. 2e2e3

d. Because Break characters are special, the print/discard action that should be performed upon them is not always the same as should be performed upon the rest of the input text. 2e2e4

For example, while typing a filename to TENEX, I want the text of the filename to be printed (echoed); but I do not want the <escape> (if I use the name completion feature) to be printed. 2e2e4a

If Bit 1 is ON The Break character is NOT to be printed. 2e2e4b

e. A separate bit (Bit 2) signals whether or not the text itself should be printed (echoed) to the terminal. If Bit 2 = 0, then the text IS to be printed. 2e2e5

f. Yet another bit (Bit 0 - right-most bit) signals whether or not any of the other bits of the command should be checked. If this bit is OFF, then the command should be interpreted to mean "continue whatever echoing strategy you have been following, using the same Break and Transmission classes." 2e2e6

This is particularly useful for the <cmd> command that follows spontaneously generated output from the Serving host (such as "System Going Down") which needs to signal End-of-Message, but does not usually want to reset any other conditions. 2e2e6a

The server may, however, alter user action after a spontaneous message, but it is possible that text will be lost, or printed when it should not be, since there is no guarantee that the RCTE <cmd> from the serving host will be properly synchronized with the terminal input. 2e2e6b

(6) Input from the terminal is (hopefully) buffered up to the occurrence of a Transmission or Break character; and the input text is echoed or not echoed, up to the occurrence of a Break Character. The most recent RCTE command determines the echo, Transmission and Break actions. 2e2f

(7) When a Break character is typed, the cycle of control is complete and action re-commences at (2). Action also automatically switches to (2) upon receipt of any text from the Server host. 2e2g

C. Notes, Comments, Etc.: 2e3

(1) Even-Numbered Commands, greater than zero, are in error, since they will have the low-order bit off. The command should be interpreted as equal to zero, which means that any Classes Reset bytes ([TC1 TC2] [BC1 BC2]) will be in error. 2e3a

(2) Servers will generally instruct Users NOT to echo Break Characters, even tho it might be alright to echo most Break characters. For example, <cr> is usually a safe character to echo but <esc> is not. TENEX Exec is willing to accept either, during filename specification. Therefore, the user must be instructed NOT to echo ANY Break Characters. 2e3b

This is generally a tolerable problem, since the server has to send an RCTE command at this point, anyhow. Adding the Break character to the message (so that it appears to be echoed) will not cause any extra Network traffic. 2e3b1

(3) The RCTE Option entails a rather large overhead. In a true character-at-a-time situation, this overhead is not justified. But on the average, it should result in significant savings, both in Network traffic and Host Wake-ups. 2e3c

(4) A severe (User) site-dependent problem will be buffering type-ahead input from the terminal. It is possible, especially in the case of TIPS, that the input buffer will overflow often. If the receiving (serving) host will permit, the accumulated text should be transmited at this point. If the text cannot be transmited and further typing by the user will result in lost text, the user should be notified. 2e3d

D. Sample Interaction: 2e4

"S:" is sent from Serving (WILL RCTE) host to Using host.
"U:" is sent from Using (DO RCTE) host to Serving host.
"T:" is entered by the terminal user.
"P:" is printed on the terminal.

Text surrounded by square brackets ([]) is commentary.
Text surrounded by angle brackets (<>) is to be taken as a single unit. E.G., carriage return is <cr>, and the decimal value 27 is represented <27>. 2e4a

The following interaction shows a Logon to a Tenex, initiation of the DED editor, insertion of some text and the return to the Exec level. A Telnet connection has already been opened, but the TENEX prompt has not yet been issued. The hosts first discuss using the RCTE option: 2e4b

S: <IAC><WILL><RCTE> 2e4c

U: <IAC><DO><RCTE> 2e4d

S: TENEX 1.31.18, TENEX EXEC 1.50.2 <cr><lf>@
<IAC><SB><RCTE><11><1><24> 2e4e

(Print the Herald and echo input text upto a Break
Character, but do not echo the Break Character. Classes 4
(Format Effectors), 5 (Non-format effector Controls and
<DEL>), and 9 (<space>) act as Break Characters.) 2e4e1

P: TENEX 1.31.18, TENEX EXEC 1.50.2 <cr><lf>@ 2e4f

T: LOGIN ARPA <cr> 2e4g

P: LOGIN 2e4h

U: LOGIN <space> 2e4i

S: <space><IAC><SB><RCTE><0> 2e4j

P: <space>ARPA 2e4k

U: ARPA <cr> 2e4l

S: <cr><lf> (PASSWORD): <IAC><SB><RCTE><7> 2e4m

P: <cr><lf> (PASSWORD): 2e4n

T: WASHINGTON 1000<cr> 2e4o

(The password "WASHINGTON" is not echoed. Action on
"1000<cr>" is withheld) 2e4o1

U: WASHINGTON <space> 2e4p

S: <space><IAC><SB><RCTE><3> 2e4q

P: <space> 1000 2e4r

U: 1000<cr> 2e4s

S: <cr><lf> JOB 17 ON TTY41 7-JUN-73 14:13 <cr><lf>@
<IAC><SB><RCTE><0> 2e4t

P: <cr><lf> JOB 17 ON TTY41 7-JUN-73 14:13 <cr><lf>@ 2e4u

T: DED <esc><cr> 2e4v

P: DED 2e4w

U: DED<esc> 2e4x

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     S: .SAV;1 <IAC><SB><RCTE><O>                                      2e4y

     P: .SAV;1                                                         2e4z

     U: <cr>                                                           2e4a@

     S: <cr><lf><lf> Ded    3/14/73 DRO,KRK <cr><lf>:
        <IAC><SB><RCTE><15><1><255>                                    2e4aa

        /The program is started and the DED prompt ":" is sent. At
        the command level, DED responds to every character./          2e4aal

     P: <cr><lf><lf> DED    3/14/73 DRO,KRK <cr><lf>:                 2e4ab

     T: IThis is a test line.<cr> This is another test line.<↑Z> Q    2e4ac

        /"I" means Insert Text. The text follows, terminated by a
        Control-Z. The "Q" instructs DED to Quit./                    2e4acl

     U: I                                                              2e4ad

     S: I<cr><lf>* <IAC><SB><RCTE><11><O><24>                          2e4ae

        /DED prompts the user, during text input, with an asterisk
        at the beginning of every line./                              2e4ael

     P: I<cr><lf> *This is a test line.                                2e4af

     U: This is a test line.<cr>                                       2e4ag

     S: <cr><lf>* <IAC><SB><RCTE><O>                                   2e4ah

     P: <cr><lf>* This is another test line.                           2e4ai

     U: This is another test line.<↑Z>                                 2e4aj

     S: ↑Z<cr><lf>: <IAC><SB><RCTE><15><1><255>                        2e4ak

        /The returned "↑Z" is two characters, not the ASCII
        Control-Z./                                                   2e4akl

     U: Q                                                              2e4al

        /Note that the "Q" is not yet printed on the terminal, since
        it is a Break character./                                     2e4all

     S: Q<cr><lf>@ <IAC><SB><RCTE><11><1><24>                          2e4am

     P: Q<cr><lf> @                                                    2e4an
```

And the user is returned to the Exec level. 2e4ao

E. Tables: 2e5

(1) <cmd> is one 8-bit byte having the following flags (bits are counted from the right): 2e5a

Bit Meaning 2e5a1

0 0 = Ignore all other bits in this byte and repeat the last <cmd> that was sent. Equals a 'continue what you have been doing'.
1 = Perform actions as indicated by other bits in this byte. 2e5a2

1 0 = Print (echo) Break character
1 = Skip (don't echo) Break character 2e5a3

2 0 = Print (echo) text up to Break character
1 = Skip (don't echo) text up to Break character 2e5a4

3 0 = Continue using same classes of Break characters.
1 = The two 8-bit bytes following this byte contain flags for the new Break classes. 2e5a5

4 0 = Continue using same classes of Transmit characters
1 = Reset Transmit classes according two the two bytes following 1) the Break classes bytes, if the Break classes are also being reset, or 2) this byte, if the Break classes are NOT also being reset. 2e5a6

Byte value (decimal) and its meaning: 2e5a7

0 = Continue what you have been doing 2e5a7a

Even numbers greater than zero (i.e., numbers with the right-most bit off) are in error and should be interpreted as equal to zero. When the <cmd> is an even number greater than zero, Classes bytes TC1 & TC2 and/or BC1 & BC2 MUST NOT BE SENT. 2e5a7b

1 = Print (echo) up to AND INCLUDING Break character 2e5a7c

3 = Print up to Break character and SKIP (don't echo) Break character 2e5a7d

5 = Skip text (don't echo) up to Break character, but PRINT Break character 2e5a7e

7 = Skip up to and including Break character 2e5a7f

Add one of the previous non-zero values to one of the following values, to get the total decimal value for the byte (Note that Classes may not be reset, without also resetting the printing action; so an odd number is guaranteed): 2e5a7g

8 = Set Break classes (using the next two bytes [BC1 BC2]) 2e5a7h

16 = Set Transmission classes (using the next two bytes [TC1 TC2]) 2e5a7i

24 = Set Break classes (using the next two bytes [BC1 BC2]) and the Transmission classes (using the two bytes after that [TC1 TC2]). 2e5a7j

(2) Classes for Break and Transmission (The right-most bit of the second byte (TC2 or BC2) represents Class 1; the left-most bit of the first byte (TC1 or BC1) represents the currently undefined Class 16): 2e5b

1: Upper-Case Letter (A-Z) 2e5b1

2: Lower-case letters (a-z) 2e5b2

3: Numbers (0-9) 2e5b3

4: Format Effectors (<BS> <CR> <LF> <FF> <HT> <VT>) 2e5b4

5: Non-format effector Control Characters, <DEL> and <ESC> 2e5b5

6: . , ; : ? ! 2e5b6

7: ‾ [(< >)] | 2e5b7

8: ' " / \ % @ $ & # + - * = ↑ ← _ ¤ 2e5b8

9: <Space> 2e5b9

And Telnet commands (IAC . . .) are ALWAYS to have the effect of a Break character. 2e5b10